CLAIMS

What is claimed is:

1. A system for desalinating salty water comprising:

a solar powered boiler that outputs a pressurized working fluid vapor;

an expander responsive to the pressurized working fluid vapor to generate an output motive force;

a pump, responsive to the motive force of said expander, to pressurize and move the salty water to said reverse osmosis unit; and

a reverse osmosis unit for receiving salty water and outputting fresh water and pressurized brine.

2. A system according to claim 1 further comprising an hydraulic motor in operable connection with said pump and responsive to the pressure of said pressurized brine, wherein said hydraulic pump imparts an augmenting motive force to said pump.

3. A system according to claim 2 wherein said hydraulic motor comprises at least one pair of rotating pistons in rolling contact to form a seal to prevent fluids from flowing from a region of high pressure to a low pressure region within said hydraulic motor.

4. A system according to claim 3 wherein the pressurized brine enters said high pressure region to transmit energy to said motor.

5. A system according to claim 1 wherein said pump comprises at least one pair of rotating pistons in rolling contact to form a seal to prevent fluids from flowing from regions of high pressure to low pressure regions within said pump.

6. A system according to claim 1 wherein said expander comprises at least one pair of rotating pistons in rolling contact to form a seal to prevent fluids from flowing from regions of high pressure to low pressure regions.

7. A system according to claim 6 wherein the pressurized working fluid vapor enters said high pressure region to transmit energy to said expander.

8. A system according to claim 1 wherein said expander comprises a first piston movable within a first cylinder, said pump comprises a second piston movable within a second cylinder, and said hydraulic motor comprises a third piston movable within a third cylinder, wherein said pistons are operably connected by a shaft, and wherein further the pressurized working fluid vapor moves said first piston within said first cylinder and said pressurized brine moves said third piston within said third cylinder, and the movement of said first and third pistons is imparted to said second piston by said shaft.

9. A system according to claim 1 wherein said expander comprises a first piston movable within a first cylinder, and said pump also comprises a hydraulic motor comprising a second cylinder movable within a second cylinder, wherein said pistons are operably connected by a main shaft, and wherein further the pressurized working fluid vapor moves

said first piston within said first cylinder and the movement of said first piston is imparted to said second piston by said main shaft.

10. A system according to claim 9 further comprising a solar collector for heating a fluid for conveyance to said boiler.

11. A system according to claim 10 further comprising:

a first secondary pump and a second secondary pump, each of said secondary pumps comprising a piston movable within a cylinder;

secondary shafts operably connecting said pistons in said secondary pumps with said main shaft;

wherein when the pressurized working fluid vapor moves said first piston within said first cylinder to impart movement to said main shaft, motion is imparted to said pistons in said secondary pumps by said secondary shafts, and wherein further said secondary pumps move fluids to said boiler and said solar collector, respectively.

12. A system according to claim 1, further comprising:

a recuperator in fluid communication with an exhaust outlet of said expander and;

a condenser in fluid communication with said recuperator;

wherein a working fluid vapor flows from said expander to said recuperator, where the working fluid vapor is cooled by heat exchange with a working fluid liquid flowing from said condenser.

13. A system according to claim 12 wherein the working fluid vapor flows into said condenser where it condenses to a liquid to transfer heat to the salty water, and wherein further the working fluid liquid is pumped to said recuperator where said working fluid is preheated before flowing to said boiler.

14. A system for desalinating salty water comprising:

a boiler that outputs a pressurized vapor;

a solar collector for heating a fluid for conveyance to said boiler;

an expander responsive to the pressurized working fluid vapor to generate an output motive force;

a reverse osmosis unit for receiving salty water and outputting fresh water and pressurized brine; and

a pump to pressurize and move the salty water to said reverse osmosis unit.

15. A system according to claim 14 further comprising:

a condenser in which a working fluid condenses;

a recuperator in fluid communication with said condenser and with an exhaust outlet of said expander wherein a working fluid liquid is preheated in said recuperator before flowing to said boiler; and

means for pumping the working fluid liquid from said condenser to said boiler, said means for pumping comprising:

an insulative first tank in fluid communication with said boiler;

an insulative second tank in fluid communication with said condenser;

a check valve for preventing flow of working fluid vapor from said second tank to said condenser;

a pump valve for regulating the flow of working fluid vapor from said boiler to said second tank;

a condenser valve for regulating the flow of working fluid vapor from said first tank to said condenser;

a release valve for regulating the flow of working fluid vapor from said second tank to said condenser;

a boiler valve for regulating the flow of working fluid vapor from said boiler to said first tank; and

a first switch in said second tank for signaling said pump valve, condenser valve, release valve and boiler valve when said second tank is full of working fluid liquid; and

a second switch in said second tank for signaling said pump valve, condenser valve, release valve and boiler valve when said second tank is empty of working fluid liquid;

wherein when working fluid vapor condenses in said condenser, the condensate drains through said check valve into said second tank; and wherein further when said second tank becomes full, said first switch closes to signal the opening of said pump and condenser valves and the closing of said release and boiler valves; and further wherein high pressure working fluid vapor from said boiler then flows to said second tank to pressurize the volume

above the working fluid liquid in said second tank to force working fluid liquid from said second tank.

16. A system according to claim 15 wherein working fluid liquid forced from said second tank is forced to said first tank, and further wherein the working fluid vapor in said first tank flows through said condenser valve to said condenser.

17. A system according to claim 16 wherein when said second tank is empty said second switch opens to signal the opening of said release and boiler valves and the closing of said pump and condenser valves, and further wherein the high-pressure working fluid vapor in said second tank flows through said release valve to said condenser, and high pressure working fluid vapor from said boiler flows through said boiler valve into said first tank, thereby allowing the working fluid liquid in said first tank to flow by gravity to said boiler.

18. A system according to claim 15 further wherein a working fluid vapor flows from said expander to said recuperator, where the working fluid is cooled by heat exchange with a working fluid liquid flowing from said condenser.

19. A system according to claim 14 further comprising an hydraulic motor in operable connection with said pump and responsive to the pressure of the pressurized brine, wherein said hydraulic pump imparts an augmenting motive force to said pump.

20. A system according to claim 19 wherein said hydraulic motor comprises at least one pair of rotating pistons in rolling contact to form a seal to prevent fluids from flowing from a region of high pressure to a low pressure region, said regions defined within said hydraulic motor.

21. A system according to claim 20 wherein the pressurized brine enters said high pressure region to transmit energy to said motor.

22. A system according to claim 19 wherein said pump is responsive to the motive force of said expander, and comprises at least one pair of rotating pistons in rolling contact to form a seal to prevent fluids from flowing from regions of high pressure to low pressure regions.

23. A system according to claim 22 wherein said expander comprises at least one pair of rotating pistons in rolling contact to form a seal to prevent fluids from flowing from regions of high pressure to low pressure regions.

24. A system according to claim 23 wherein the pressurized vapor enters said high pressure region to transmit energy to said expander.

25. A system according to claim 14 wherein said expander comprises a first piston movable within a first cylinder, said pump comprises a second piston movable within a second cylinder, and said hydraulic motor comprises a third cylinder movable within a third cylinder, wherein said pistons are operably connected by a shaft, and wherein further the pressurized vapor moves said first piston within said first cylinder and said pressurized

brine moves the third piston within said third cylinder, and the movement of said first and third pistons is imparted to said second piston by said shaft.

26. A system according to claim 14 further wherein said expander comprises a first piston movable within a first cylinder and said pump also comprises a hydraulic motor comprising a second cylinder movable within a second cylinder, wherein said pistons are operably connected by a main shaft, and wherein further the pressurized vapor moves said first piston within said first cylinder and the movement of said first piston is imparted to said second piston by said main shaft.

27. A system according to claim 26 further comprising:

a first pump and a second secondary pump, each of said secondary pumps comprising a piston movable within a cylinder;

secondary shafts operably connecting said pistons in said pumps with said main shaft;

wherein when the pressurized vapor moves said first piston within said first cylinder to impart movement to said main shaft, motion is imparted to said second pistons in said pumps by said secondary shafts, and wherein further said pumps move fluids from said solar collector to said boiler, and from said condenser to said boiler, respectively.

28. A system according to claim 15 wherein the working fluid flows into said condenser where it condenses to a liquid to transfer heat to the salt water, and wherein further the working fluid liquid is pumped to said recuperator where said working fluid is preheated before flowing to said boiler.

29. A system for desalinating water comprising:

a boiler that outputs a pressurized working fluid vapor;

a solar collector for heating a fluid for conveyance to said boiler;

an expander responsive to the pressurized working fluid vapor to generate an output motive force;

a reverse osmosis unit for receiving salty water and outputting fresh water and pressurized brine;

a pump to pressurize and move the salty water to said reverse osmosis unit;

a condenser in which working fluid vapor condenses; and

a recuperator in fluid communication with said condenser and with an exhaust outlet of said expander, wherein a working fluid liquid is preheated in said recuperator before flowing to said boiler